

Claims

1. A process for producing an amide compound, which comprises reacting a compound having an amino group with a polyaminopolycarboxylic acid anhydride in the presence of the polyaminopolycarboxylic acid.

2. The process according to claim 1, wherein the compound having an amino group is a protein, a peptide, an amino acid, an amino sugar or an amine.

3. The process according to claim 2, wherein the amino sugar is an amino oligosaccharide or an amino oligosaccharide having a reduced terminal reducing group.

4. The process according to claim 3, wherein the molecular weight of the amino oligosaccharide is 500 to 2000.

5. The process according to claim 4, wherein the amino oligosaccharide having a molecular weight of 500 to 2000 is a glucosamine oligosaccharide or a galactosamino oligosaccharide.

6. The process according to claim 5, wherein the glucosamine oligosaccharide is a chitosan tri- to deca-saccharide.

7. The process according to claim 5, wherein the galactosamino oligosaccharide is a galactosamine tri- to deca-saccharide.

8. The process according to claim 1, wherein the polyaminopolycarboxylic acid is ethylenediamine-tetraacetic acid, diethylenetriamine-pentaacetic acid, or 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid.

9. The process according to claim 1, wherein the

polyaminopolycarboxylic acid anhydride is added to a mixture of the compound having an amino group and the polyaminopolycarboxylic acid.

10. The process according to claim 1, wherein the compound having an amino group and the polyaminopolycarboxylic acid anhydride are added to the polyaminopolycarboxylic acid.

11. The process according to claim 10, wherein the compound having an amino group and the polyaminopolycarboxylic acid anhydride are added simultaneously to the polyaminopolycarboxylic acid.

12. The process according to claim 1, wherein the reaction is performed in the presence of a solvent.

13. The process according to claim 12, wherein the solvent is at least one selected from the group consisting of water and an organic solvent.

14. The process according to claim 13, wherein the solvent is water.

15. The process according to claim 1, wherein the reaction is performed in the presence of a base.

16. The process according to claim 1, wherein the compound having an amino group is a chitosan tri- to deca-saccharide, a chitosan tri- to deca-saccharide having a reduced terminal reducing group, a galactosamine tri- to deca-saccharide, a galactosamine tri- to deca-saccharide having a reduced terminal reducing group, serum albumin, fibrinogen, galactosyl serum albumin, amylase, pepsin, IgG, Fab, Fab', thyroid-stimulating hormone, a growth hormone, prolamine, glutelin, Pyr-Lys-Arg-Pro-Ser-Gln-Arg-Ser-Lys-Tyr-Leu, D-Phe-octreotide,

polylysine, oxytocin, bradykinin, valinomycin, colistin, an α -amino acid, a β -amino acid, a γ -amino acid, aniline, 4-methylaniline, 4-octylaniline, ethylamine, n-propylamine, isopropylamine, n-butylamine, sec-butylamine, isobutylamine, tert-butylamine, n-octylamine, n-decylamine, (1-naphthylmethyl)amine, N-methylaniline, N-methyl-4-ethylaniline, N-methyl-4-octylaniline, diethylamine, N-ethyl-N-propylamine, ethylenediamine, dansylethylenediamine, dansylhexamethylenediamine, N-(1-naphthyl)ethylenediamine, 1-naphthalenesulfonylethylenediamine, hexamethylenediamine, or phenylenediamine.

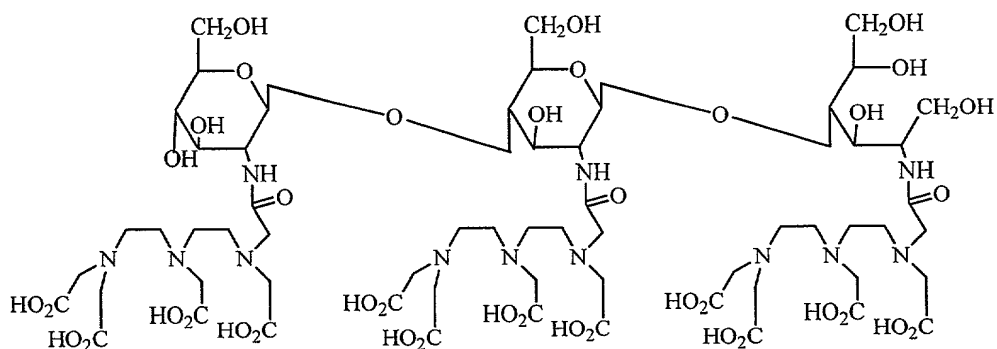
17. The process according to claim 1 or 16, wherein the polyaminopolycarboxylic acid anhydride is ethylenediaminetetraacetic dianhydride, ethylenediaminetetraacetic acid monoanhydride, diethylenetriaminepentaacetic acid dianhydride, diethylenetriamine-pentaacetic acid monoanhydride, 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic dianhydride, or 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid monoanhydride

18. The process according to claim 17, wherein the amide compound is a conjugate of a human serum albumin and diethylenetriaminepentaacetic acid,

a conjugate of galactosyl serum albumin and diethylenetriamine-pentaacetic acid,

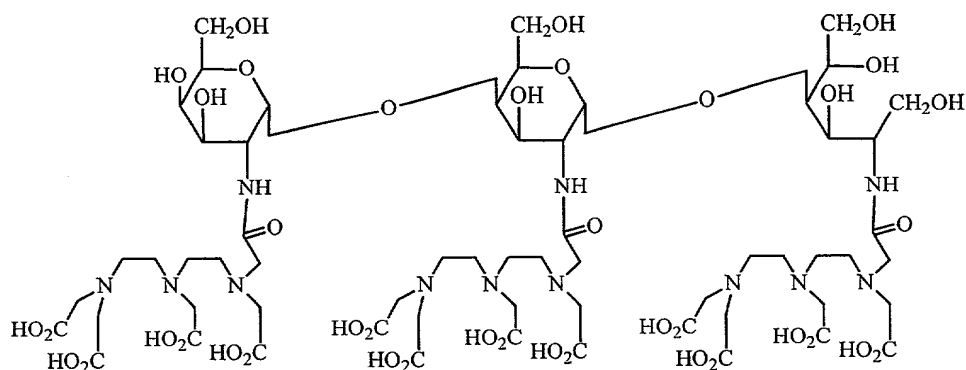
a conjugate of D-Phe-octreotide and diethylenetriamine-pentaacetic acid,

an amide compound of formula (1),



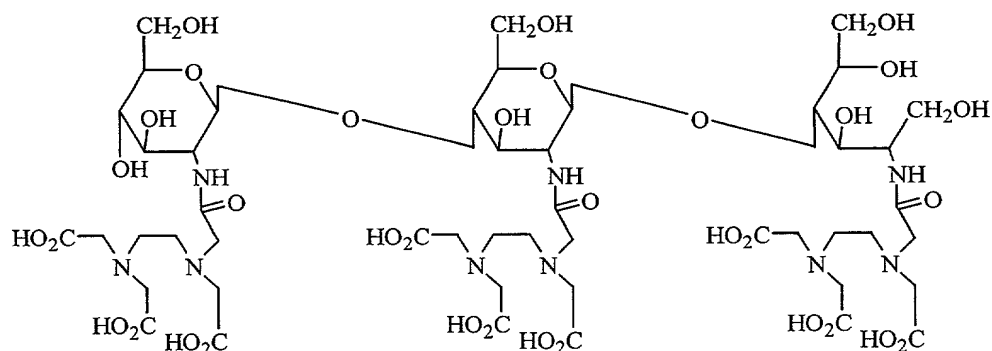
(1)

an amide compound of formula (4),



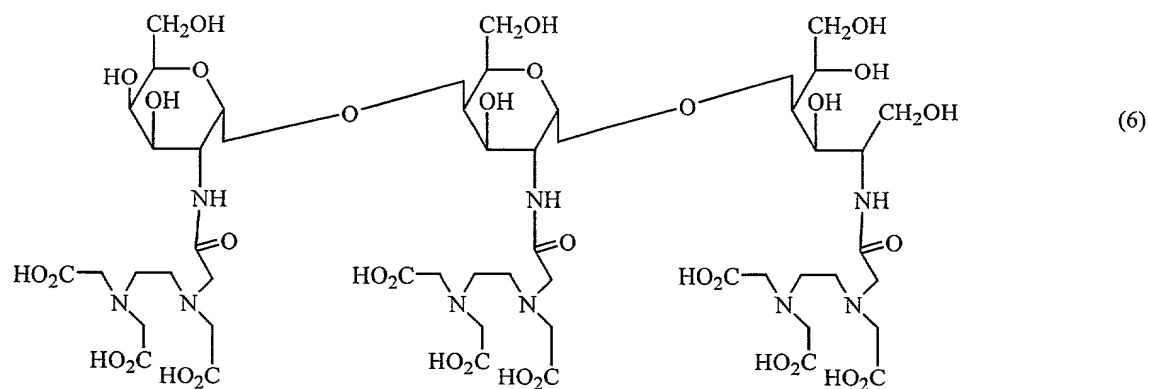
(4)

an amide compound of formula (5),

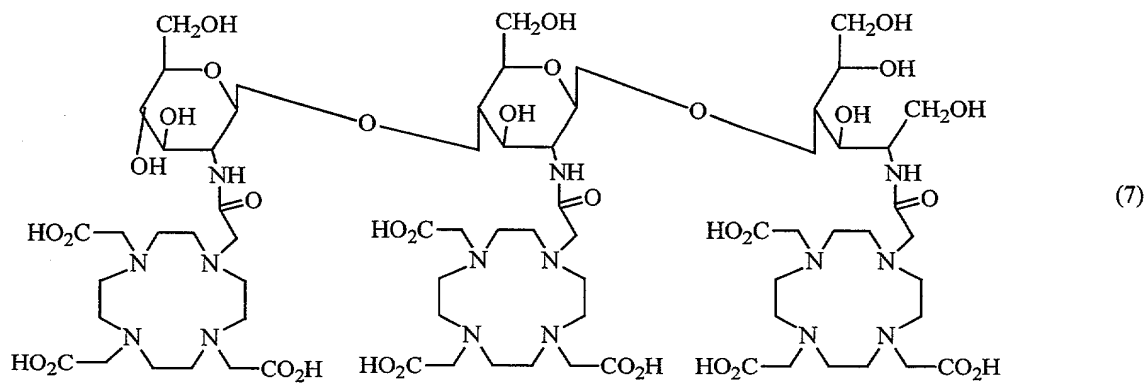


(5)

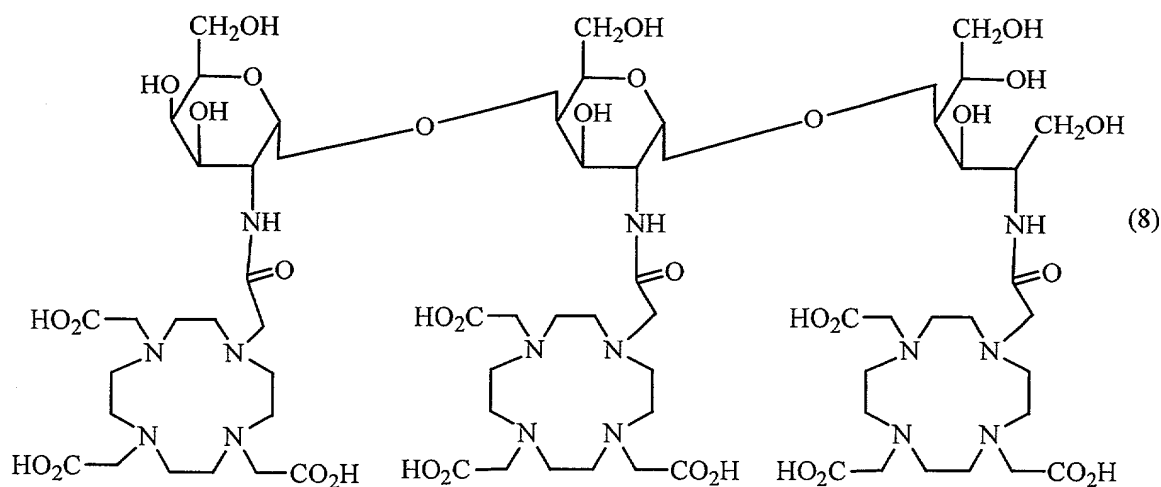
an amide compound of formula (6),



an amide compound of formula (7),



an amide compound of formula (8),



N-(phenylcarbamoylmethyl)diethylenetriamine·N,N',N'',N'''-tetraacetic

acid, N-(4-octylphenylcarbamoylmethyl)ethylenediamine-N,N',N''-triacetic acid,

N-(4-octylphenylcarbamoylmethyl)diethylenetriamine-N,N',N'',N'''-tetraacetic acid,

5 N-[(6-dansylaminohexyl)carbamoylmethyl]diethylenetriamine-N,N',N'',N'''-tetraacetic acid, or

N,N'''-bis(phenylcarbamoylmethyl)diethylenetriamine-N,N',N''-triacetic acid.